Energy Management

What is needed?

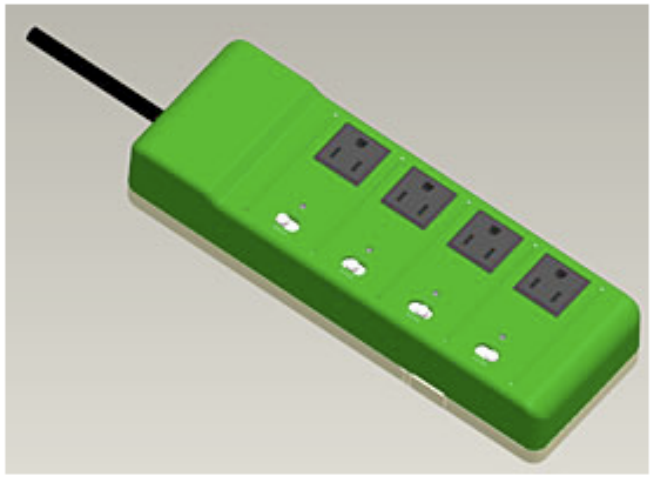
- Basic objective
  - operating communication networks and other equipment with a minimal amount of energy while maintaining service level performance
- Management functions
  - Monitoring power states
  - Monitoring instantaneous power (energy consumption rate)
  - Monitoring power quality
  - Monitoring (accumulated) energy consumption
  - Monitoring batteries
  - Setting and enforcing power states

More than just MIB modules

- We need MIB modules for the monitoring functions
- We may also need something for setting power states (YANG module?)
- But some aspects of monitoring power and energy consumption are different from typical monitoring functions
  - Probes are located at separate devices
  - Probes monitoring accumulated values for more then one device

Remote Power Monitoring Examples I

- Power Distribution Units (PDUs) / Power strips
  - Switch on/off per socket
  - Power/energy monitoring per socket



- Power over Ethernet (PoE) sourcing devices
  - PoE switches monitor and control power supply of attached devices
  - Unfortunately: per-port power monitoring not supported by PoE MIB module

Remote Power Monitoring Examples II

- Energy data collectors
  - Data center / building / sensor network
  - Often non-IP communication between probes and collectors
  - Wired (powerline, field bus, non-standard) and wireless
  - In some cases intermittent connectivity
  - With just a single client device: protocol converter
- Devices in examples act as mid-level managers
  - Collecting power information
  - Discovering and identifying, adding context to concerned devices
  - Providing structured information to energy management system
- We need an **energy management framework**
  - Defining role of mid-level manager
  - Modeling relationship between mid-level manager and monitored devices (parent – child)
  - Defining common terms and categories (power states, etc.)

History

- Initial proposal presented at IETF 75
- Requirements discussed at IETF 76
  - draft-quittek-power-monitoring-requirements-00
- Four MIB modules submitted for discussion at IETF 77
  - draft-claise-energy-monitoring-mib-02
  - draft-quittek-power-mib-00
  - draft-teraoka-powerconsumption-mib-01
  - draft-sreek-powerconsumption-mib-01

Current Drafts

- Considerations for Power & Energy Management
  - draft-norwin-energy-consider-00
- Requirements for Energy Management
  - draft-quittek-power-monitoring-requirements-01
- Power Management Architecture
  - draft-claise-power-management-arch-00
- MIB modules for energy, power, power quality, power state, and battery monitoring
  - draft-claise-energy-monitoring-mib-04
  - draft-quittek-power-mib-01

Charter Proposal

- Six work items, some under discussion for a year
  1. Requirements for energy management ✓
  2. Energy management framework ✓
  3. Energy and Power Monitoring MIB module ✓
  4. Power State MIB module ✓
  5. Battery MIB module ✓
  6. Applicability statement ✗
- Number of documents to be discussed
- Schedule
  - WG by IETF 79
  - First versions of most docs in Dec 2011 (applicability in Apr)
  - Completion of most docs in Aug 2011 (applicability in Dec)

Why having a dedicated WG for this?

- Brings energy management more visible
  - Also outside of IETF
  - Easier to follow
- Gives a group to focus
  - Will not usurp time for other items from OPSAWG
  - Will need to discuss more concepts than monitoring
  - Aggregation of data, discovery of endpoints, etc.
- Energy becoming a discipline like the items in FCAPS
  - FCAPS+E
  - Need to limit the scope with a charter to avoid stretching too far too soon

Questions

- Should this work be done by the IETF?
- Should it be done within the OPSAWG or in a separate WG?

Appendix 1:
Detailed charter proposal

Charter: Introduction (I)

- Energy management is becoming an additional requirement for network management systems caused by rising energy cost and an increasing awareness of the ecological impact of operating IT and networking equipments.

- The basic objective of energy management is operating communication networks and other equipments with a minimal amount of energy while still providing sufficient performance to meet service level objective. A discussion of detailed requirements has already started in the OPSAWG, but further exploration in the ENERGY WG is needed.

Charter: Introduction (II)

- So far, there are very little means defined in IETF documents for energy management of devices and networks including power monitoring, energy consumption monitoring, and power state control. The OPSAWG started working on a MIB module for monitoring energy consumption and power states and found that more than just a MIB module is needed. Rather a new framework for energy management needs to be developed first.

Charter: Introduction (III)

- A particular difference between energy monitoring and other monitoring tasks is that in many cases energy consumption of a device is not measured at the device itself but at a different place, such as, for example, at a Power over Ethernet sourcing device or at a smart power strip. A device reporting energy consumption may report not just its own consumption but do this also for other remote devices. This require a clear definition of the relationship between devices and identification of remote devices for which monitoring information is provided. Similar considerations apply to power state control of remote devices, for example, at a power over Ethernet sourcing device that switches on and off power at its ports.

Charter: Work Items (I)

- 1. Requirements for energy management.
  A requirements document will specify for which power and energy-related properties of devices and components monitoring functions need to be provided. Also the need for control functions will be discussed. It will further elaborate on the need to monitor and control properties of devices that are remote to the monitoring probe.

Charter: Work Items (II)

- 2. Energy management framework.
  A framework document will describe extensions to current management frameworks that are needed for energy management: power and energy monitoring, including power states, power state control, and potential power state transitions. Particularly, the relationships between powering devices, powered devices, and monitoring probes need to be elaborated. The way how to set power states will be discussed. For the case of a device reporting for and controlling other devices, the framework will address the issues of detection and identification of remote devices.

Charter: Work Items (III)

- 3. Energy and Power Monitoring MIB module
  The ENERGY WG will develop a MIB module for energy consumption Monitoring. The MIB module will provide means for reporting detailed properties of the actual energy consumption rate (power) and of accumulated energy consumption according to the “requirements for energy management”. Further, it will provide information on electrical power quality.

Charter: Work Items (IV)

- 4. Power State MIB module
  The ENERGY WG will develop a MIB module for power state monitoring. The module will provide means for retrieving power states of a component, properties of power states, current power state, and power state transitions and power state statistics. Optionally, the controlling of power states could be added.

Charter: Work Items (V)

- 5. Battery MIB module
  The ENERGY WG will develop a MIB module for battery monitoring. The MIB module will provide means for reporting detailed properties of the actual charge, age, and state of a battery and of battery statistics.

Charter: Work Items (VI)

- 6. Applicability statement
  The ENERGY WG will develop an applicability statement, describing the variety of applications that can use the energy framework and associated MIB modules. Potential examples are building networks, home energy gateway, etc. Finally, the document will also discuss limitations of the framework and relations to other architectures and frameworks (such as smart grid).

Charter: Milestones

Dec 2010 Publish Internet draft on energy management requirements

Dec 2010 Publish Internet draft on energy management framework

Dec 2010 Publish Internet draft on Power State MIB

Dec 2010 Publish Internet draft on Energy MIB

Dec 2010 Publish Internet draft on Battery MIB

Apr 2011 Publish Internet draft on energy management applicability

Apr 2011 Submit Internet draft on requirements as Informational RFC

Aug 2011 Submit Internet draft on framework as Informational RFC

Aug 2011 Submit Internet draft on Power State MIB as Standard Track RFC

Aug 2011 Submit Internet draft on Energy MIB as Standard Track RFC

Aug 2011 Submit Internet draft on Battery MIB as Standard Track RFC

Dec 2011 Submit Internet draft on applicability as Informational RFC

Current Drafts (I)

1. Considerations for Power and Energy Management
   - draft-norwin-energy-consider-00
   - Considerations on scope
   - Considerations on devices, NMS, MIB modules

Current Drafts (II)

2. Requirements for Energy Management
   - draft-quittek-power-monitoring-requirements-01
   - Started as requirements for power monitoring
   - has been extended to general energy management
   - Presents scenarios for energy management
   - Lists required management functions
   - Discusses devices to be considered

Current Drafts (III)

3. Power Management Architecture
   - draft-claise-power-management-arch-00
   - A proposal for an energy management architecture

Current Drafts (IV)

4. Power and Energy Monitoring MIB
   - draft-claise-energy-monitoring-mib-04
   - MIB modules for energy and power state monitoring

Current Drafts (V)

5. Definition of Managed Objects for Energy Management
   - draft-quittek-power-mib-01
   - Three MIB separate modules
     - Power state monitoring
     - Actual power and accumulated energy consumption monitoring
     - Battery monitoring
   - Monitoring only

Appendix 2:
List of Current Internet Drafts

Current Drafts (I)

1. Considerations for Power and Energy Management
   - draft-norwin-energy-consider-00
   - Considerations on scope
   - Considerations on devices, NMS, MIB modules

Current Drafts (II)

2. Requirements for Energy Management
   - draft-quittek-power-monitoring-requirements-01
   - Started as requirements for power monitoring
   - has been extended to general energy management
   - Presents scenarios for energy management
   - Lists required management functions
   - Discusses devices to be considered

Current Drafts (III)

3. Power Management Architecture
   - draft-claise-power-management-arch-00
   - Proposal for an energy management architecture
   - Devices in scope
   - Scenario descriptiosn
   - Parent-child concept
   - Power level definitions

Current Drafts (IV)

4. Power and Energy Monitoring MIB
   - draft-claise-energy-monitoring-mib-04
   - Two MIB separate modules
     - Power state monitoring
     - Actual power and accumulated energy consumption monitoring
     - Power quality monitoring
   - Providing context information
   - User-defined power levels

Current Drafts (V)

5. Definition of Managed Objects for Energy Management
   - draft-quittek-power-mib-01
   - Three MIB separate modules
     - Power state monitoring
     - Actual power and accumulated energy consumption monitoring
     - Battery monitoring
   - Monitoring only